PB-217 767

THE AIR POLLUTION PROBLEM IN PORTLAND, OREGON. REPORT TO THE PORTLAND BUREAU OF HEALTH

Jean J. Schueneman

Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

September 1956

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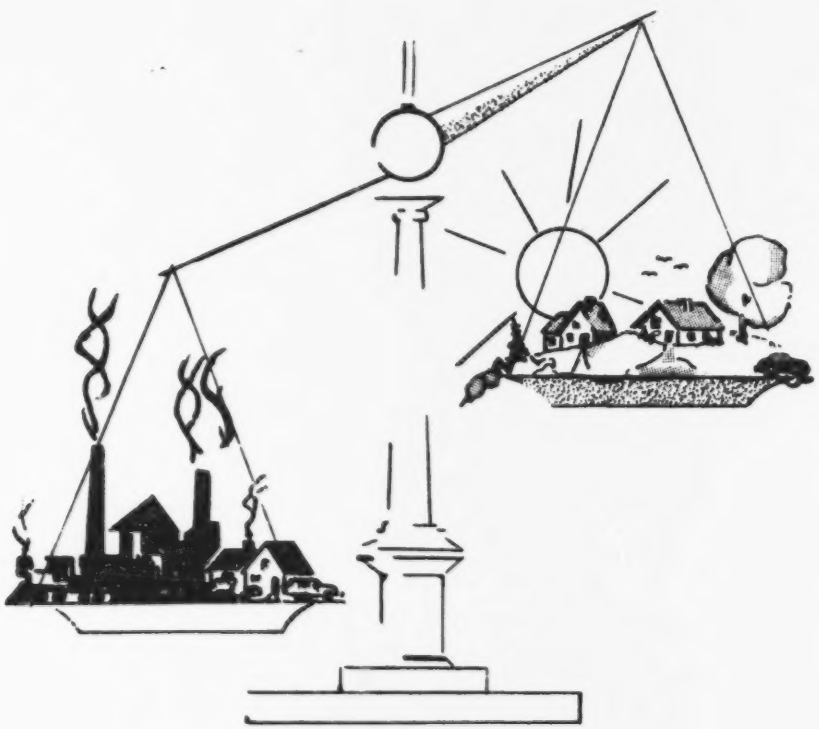

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U.S. Department of Health, Education and Welfare
Public Health Service
Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

September, 1956

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IN

PORTLAND, OREGON

Report To The
Portland Bureau of Health

Jean J. Schueneman
Public Health Engineer
Community Air Pollution Program

U. S. Department of Health, Education and Welfare
Public Health Service
Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

September 1956

I

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INITIATION OF THE STUDY

There is a feeling of concern in the City of Portland as to the general status of the atmospheric resources of the City and what, if any, additional action is warranted on the part of the City Government with regard to this important part of the public domain.

This feeling was evidenced by a request by the Health Officer of the City, endorsed by the State Health Officer, that the Public Health Service provide technical advice to enable Portland to coordinate present activities and to develop a logical plan for air pollution control. A copy of this letter dated April 27, 1956 is included in this report as Appendix A.

PURPOSES OF THE STUDY

The purposes of the Public Health Service study were developed through a conference in Portland, on April 24, 1956, attended by representatives of the City Government, the State of Oregon Board of Health, Portland Air Pollution Advisory Committee and the Public Health Service and through correspondence between the City Health Officer and the Public Health Service. These purposes were set forth by the Service in a letter to the City Health Officer (who expressed concurrence) as follows:

1. Indicate whether or not a more extensive and elaborate survey of atmospheric pollution should be conducted;
2. Determine whether or not local air pollution control should be initiated at this time or

await the completion of research efforts now being undertaken and;

3. If air pollution control efforts should be undertaken locally at this time, what form they should take and what staff, budget, laboratories and legislation would be required.

CONDUCT OF THE STUDY

A Public Health Engineer from the Community Air Pollution Program of the Public Health Service's Robert A. Taft Sanitary Engineering Center spent the week of July 9-13, 1956 in Portland, Oregon. Arrangements for his conferences, visits and inspections were made by the Portland Bureau of Health. Inspection trips were made in and around the City and conferences were held with persons associated with the following agencies, whose cooperation and contribution of information are gratefully acknowledged:

Chamber of Commerce of Portland

City of Portland, Oregon

- Bureau of Buildings
- Bureau of Health
- City Planning Office
- Civil Service Board
- Mayor

Columbia Empire Industries

Oregon State Board of Health, Air Pollution Authority

Portland Air Pollution Advisory Committee

Stanford Research Institute

U. S. Weather Bureau, Portland Office

It should be recognized that an exhaustive investigation and study could not be made within the short time available. However, it is believed that this study has brought together enough information from the various sources to permit tentative answers to be made to the questions set forth in the "Purposes of the Study."

Before concluding his work in Portland, the Public Health Service engineer met with representatives of the Oregon Board of Health and the Portland Bureau of Health to discuss the information that had been obtained and the findings and recommendations that could be made on the basis of all the available knowledge. This report is substantially in accord with these discussions.

SUMMARY OF FINDINGS

1. It would be desirable to conduct a more extensive and elaborate study of the air pollution present, the nature and extent of pollution sources and the meteorological patterns in the area. Such studies would provide information for use in planning, accomplishment and evaluation of control activities, planning a land use pattern for the future and other uses.

2. (a) Local air pollution control should be initiated at this time and should await neither the completion of the more extensive study noted above nor the completion of research on air pollution now under way in many parts of the nation.

   (b) The more extensive study noted above would best be done by the local control agency as one of its first tasks.

3. (a) The local control agency should preferably have a staff of six persons; a budget of about $45,000 per annum; and utilize existing Bureau of Health laboratories.

   (b) The changes in air pollution legislation considered desirable are:

      (1) To bring smoke emission standards up to date.

      (2) To institute regulation of new installations likely to add air pollution to the city, eventually by a permit system, in the interim, by a registration system for such new installations

and for existing ones, in selected significant categories.

(3) To allow the promulgation of future rules and regulations, and

(4) To incorporate certain technical provisions concerning appeals, penalties, sealing of equipment, etc.

I. EXTENT OF AIR POLLUTION PROBLEM IN PORTLAND

A. Sources of Pollution

1. Fuel Usage

There are approximately 21,000 tons of coal, 20,000 tons of briquets, 96 million gallons of oil, 16 million therms of gas, and considerable quantities of sawdust and wood consumed as fuel in the city each year. This sizable fuel usage makes a significant contribution to pollution of the atmosphere.

2. Transportation

There are in the neighborhood of 210,000 automobiles, 22,000 trucks and 400 buses operating in Multonomah County. Although no exact data were obtained concerning the fuel usage by these vehicles, it is estimated that the daily consumption of gasoline in passenger automobiles is abou 420,000 gallons, that trucks use about 115,000 gallons of gasoline and diesel fuel

(approximately 60% gasoline) and that buses use about 6,500 gallons of gasoline and diesel fuel. (Proportion of each not estimated).

There is also a considerable amount of fuel, largely diesel oil, consumed in the area by railroad locomotives and an undetermined quantity and type of fuel usage by water borne vessels.

All of these activities discharge pollutants, both visible and invisible, to the atmosphere in considerable amounts.

3. Industry and Commerce

There are a wide variety of industrial and commercial establishments in and around Portland capable of emitting significant quantities of pollution to the atmosphere. Establishments in and around Portland include:

steel mills
ferrous and non-ferrous foundries
metal plating and heat-treating
tin can manufacture
power generation
coke and gas manufacture
ready mix concrete
sand, gravel, and stone production
cement manufacture
asphalt road mix

3. Industry and Commerce (Cont'd.)

tar and asphalt coating

sand blasting

roofing material manufacture

coffee roasting

brewing

butter manufacture

food processing

stock yards

sluaghtering and rendering

fertilizer production

paint, varnish and paper manufacture

paint spraying

wood waste burners

scrap yards

textile fiber manufacture

rubber processing

leather and woodworking

chemical and soap manufacture

refuse disposal and dumps

4. Residential Establishments

Individually, these are not significant sources of pollution but collectively they contribute a considerable amount of pollution both visible and invisible to the atmosphere through the use of fuel for space and water heating and the disposal of refuse by burning in incinerators, baskets, cans, open fires, etc.

B. General Indications of the Extent of Air Pollution in Portland

1. Some reduced visibility was observed and reports were received of the existence of more severely reduced visibility during other periods of the year. Measurements of the total suspended particulate matter in the atmosphere of Portland and the acetone soluble portion of this material which have been made by the State Air Pollution Authority and the national air sampling network of the Public Health Service indicate that the concentration of these materials in the atmosphere of Portland is of the same magnitude as concentrations found in other cities of comparable size. This is indicated by the data in the following table.

Public Health Service
National Air Sampling Network Data
(Average values in micrograms per cubic meter of air)

City	Total Particulate Loading	Acetone Soluble Particulate Loading
Portland, Oregon	143	32.1
Atlanta, Georgia	137	24.2
Cincinnati, Ohio	176	31.4
Houston, Texas	129	18.5
Kansas City, Mo.	146	18.4
Minneapolis, Minn.	120	15.8
San Francisco, Cal.	104	19.4

From Chambers, L. A., Foster, M. J., Cholak, J. A Comparison of Particulate Loadings in Certain American Cities; Third National Air Pollution Symposium, Pasadena, Cal., April 18, 1955.

2. The Portland Bureau of Health, during the past 20 months has been concerned with air pollution problems at more than seventy establishments as a result of complaints of the public about smoke, settled dust, odors, fumes, soot, etc.
3. In view of the magnitude of sources of pollution, it is certain that soiling of buildings, wearing apparel, vehicles, home and office furnishings and shelf stocks in stores will be caused by atmospheric pollution. Some observations of this were made during this survey. Specific evaluation of the importance of this factor cannot be made on the basis of such a brief survey.
4. Some problem in the soiling of surfaces from materials settling out of the air is indicated on the basis of measurements made by the State Air Pollution Authority. The measurements indicate that nuisance and near nuisance situations exist in certain parts of the City.
5. Some instances of eye irritation and damage to vegetation have been reported in localized areas of Portland.
6. The City Planning Office has indicated that the population of the City now is 420,000 people, with an additional 288,000 in the remainder of the Portland urban area. By 1975 the Planning Office

expects the population of the City to be 506,000 with an additional 513,000 in the remainder of the urban area. These people will require homes, transportation and places to work, all of which will increase the load of pollution discharged to the atmosphere.

C. Sources Outside the City

There are establishments located outside of the City which contribute considerable quantities of pollution to the envelope of atmosphere surrounding the City. Action will be needed to control these sources if a City program is to be fully successful. The State Air Pollution Authority has taken some action in this regard and has authority to continue.

D. Meteorological and Topographical Considerations

The meteorological patterns and topographical features in the Portland area are such that conditions for the dispersion of atmospheric pollutants should be termed "fair." This is evidenced by the existence of moderate monthly average wind speeds ranging from 6 to 7.3 miles per hour, the considerable (20-25%) prevalence of winds in the 0, 1, 2, and 3 miles per hour speeds, and the fairly frequent occurrence of temperature inversions, with some persisting for more than forty-eight hours. The topographical features of the area embody enough hills, river valleys and mountains

that a reduced ventilation rate because of them would be expected.

II. PRESENT ACTIVITY IN PORTLAND ON AIR POLLUTION CONTROL

A. Bureau of Health

One sanitarian devotes nearly all of his time to investigation of complaints of atmospheric pollution and, through negotiation with those responsible for the pollution, attempts to secure a reduction, elimination or modification of the emission to the atmosphere. The Health Officer and one other man in the Bureau spend part of their time on air pollution matters.

B. Zoning

The existing zoning law provides for some restrictions on the location of certain listed industries likely to cause air pollution and allows restriction of others not specifically listed. It is understood that a new zoning law which will, among other things, prevent the construction of residences in industrial zones, is under consideration. From an air pollution standpoint, such a provision is desirable.

C. Bureau of Buildings

Through enforcement of the Heating Code, the Bureau of Buildings accomplishes a measure of control of atmospheric pollution from warm air heating

units. This Bureau can control nuisances resulting from the venting of heating units, cooking units, etc., through its ability to require extension or relocation of chimneys. Authority for such action is set forth in Sections 7-3713 and 7-3737 of the Building Code. The Bureau also has responsibility for the issuance of occupancy permits provided for in the Zoning Ordinance.

D. Oregon State Air Pollution Authority

The State Authority has made a considerable number of measurements of air pollution in the Portland area and has indicated that it will continue to do so. It has also consulted with the Portland Bureau of Health on the means of abatement of certain unsatisfactory conditions, the evaluation of certain situations alleged to be unsatisfactory and the determination of whether certain proposed installations are likely to cause unsatisfactory atmospheric conditions. Proposed standards for suspended particulate matter and settled dust to be applied on a State-wide basis have been prepared. Other standards can be expected in the future. The Authority has recently prepared a "Summary of Air Pollution Data Obtained from Sampling Stations in Portland from October 1952 to July 1956", dated July 26, 1956.

III. AIR POLLUTION STANDARDS

Criteria for acceptable quality of the atmosphere with regard to health effects, visibility, and nuisance creation are, at the present time, quite subjective. Measurements can be made of a number of indicators of atmospheric pollution, but very few values have been established as indicating acceptable or unacceptable atmospheric quality. The manifestations of polluted atmospheres which are detectable by the senses, such as reduced visibility, soiling of surfaces and the existence of odors, which may be considered acceptable in one community may be considered excessive in another.

Standards for the emission of smoke from combustion processes as measured by the Ringlemann Chart method have been in use for many years with some differences existing from area to area. There is also reasonable acceptance of criteria for the discharge of particulate matter from combustion processes, such as space heating units and power stations. In Los Angeles, standards regulating the discharge of particulate matter from processes other than combustion and for the emission of sulphur dioxide have been established. Recently, some standards for the emission of visible pollutants from autos, trucks and buses have been established in a few cities. Of course, specific air pollution standards and criteria found desirable in one area are not necessarily suitable for

application in another. However, air pollution control programs based on application of standards such as these have been successful in numerous cities. These programs have achieved an improvement (in some cases spectacular) in the quality of the general atmosphere and have caused the elimination or prevention of thousands of neighborhood problems.

Considerable research is underway which may yield more objective and precise information upon which to base standards in the future. However, the prospect is that fully satisfactory answers as to what is satisfactory air quality and what is satisfactory performance of each source of pollution will not be available for some years to come. The benefits to be derived from a program inaugurated now, based on the best presently available information and standards, will far outweigh the loss to the community of deferring action to some indefinite future date when all that we presently do not know about air pollution shall have been revealed.

In order to have some idea of the importance placed on air pollution control activities in other cities of comparable size, it is pertinent to note that in 1955 nine cities ranging in size from 300,000 to 700,000 population expended an average of $36,000 per year on air pollution control.

IV. SUGGESTED PROGRAM FOR THE CITY OF PORTLAND

A. General

In view of the existing air pollution situation in Portland and its expected growth, a considerably expanded air pollution control activity is warranted. A well conceived program put into effect now could well be the "ounce of prevention" which would obviate the need for a more expensive "pound of cure" program at a future date.

B. Law Changes

1. The provisions of the present Portland ordinance regulating the emission of dense smoke are out of date. The table given herein is suggested for consideration, in either the ordinance itself, an annex to it, or a regulation of the Bureau. The shade numbers refer to the Ringlemann Chart. It is suggested that provision be made for alternate use of charts, instruments or devices other than the Ringlemann Chart for grading the shade of smoke. Wording which will permit the similar grading of emissions of materials (except steam) that are not grey or black, based on an equivalent opacity or visibility obscuration, is also suggested.

2. Consideration should be given to regulation of new installations likely to produce air pollution. The most effective means of doing this is to

TABLE OF SMOKE EMISSION STANDARDS

TYPE OF INSTALLATION	LIMITING DENSITY, SHADE OR APPEARANCE OF SMOKE
A. Domestic installations, primarily for heating and hot water, in one and two family dwellings.	Not darker than Shade No. 1, except that smoke not darker than Shade No. 3 is permitted for not more than 4 minutes in any period of 30 minutes when starting a new fire.
B. Installations, primarily for heating and hot water in apartment houses, office buildings, schools, hotels, loft buildings, hospitals and other installation of similar character.	Not darker than Shade No. 1, except that smoke not darker than Shade No. 3 is permitted for not more than a total of 4 minutes in any period of 30 minutes.
C. All other stationary installations.	Not darker than Shade No. 2, except that smoke not darker than Shade No. 3 is permitted for not more than a total of 4 minutes in any period of 30 minutes.
D. Marine Installations.	Not darker than Shade No. 2, except that smoke not darker than Shade No. 3 is permitted for not more than a total of 1 minute in any period of 6 minutes.
E. Locomotives.	Not darker than Shade No. 2, except that smoke not darker than Shade No. 3 is permitted for not more than a total of 1/2 minute in any period of 3 minutes.

require a permit prior to construction of such installations. The successful operation of a permit system requires the availability of a staff capable of evaluating such plans and specifications as may be required to be filed with permit applications. It is likely that such a staff will not be available at the outset of the program and for this reason, it is suggested that a registration system be used as an interim measure until the necessary competency can be made available to initiate a permit system. The registration system should require any person who builds or substantially alters a device or plant which may emit pollution to the atmosphere obtain a certificate of registration from the control agency before starting work. This gives the control official knowledge of the proposed unit and affords him an opportunity to acquaint the applicant with the requirements he must meet and to discuss the proposed work with him.

Since many units which may emit pollution are of such a nature that registration and permits are not necessary to effect their control, a good deal of work can be saved with only a minor loss in effectiveness, by exempting some classes of units from both systems. Such units include standard

commercial gas fired equipment, units burning No. 1 or No. 2 fuel oil, in standard commercial equipment, small solid fuel burning units and temporary units. Minor repairs and alterations of all units can also be excluded.

Provision should be made for registration of existing units, in the non-exempt categories within a period of one year, or upon request of the Bureau of Health prior to the expiration of one year. A fee could be required for such registration and administrative arrangements made to have such applications taken by the Bureau of Buildings (for referral to the Bureau of Health) to eliminate duplication of filing locations. The Bureau of Health should require sufficient information from applicants to enable an appraisal of the air pollution significance of the proposed plant or equipment.

3. The ordinance should include provisions on penalties, separability, persons liable and authority to seal non-conforming installations.
4. Authority to promulgate the rules and regulations necessary to accomplish the purposes of the act should be given to such board, commission, body or individual as competent legal consideration indicates as proper procedure in Portland, and procedures for

promulgating them spelled out. It is understood that the City can enforce State laws, and it is expected that the State will keep its rules and regulations complete and up to date, therefore, if City officials can enforce and apply rules and regulations promulgated by the State Air Pollution Authority, there will not be a great need for extensive city rules and regulations.

5. Procedures for appeals from actions of the Health Officer on air pollution matters should be specified.
6. Consideration should be given to air pollution control personnel being included in the Civil Service structure of the City.

C. MONITORING PROGRAM

A continuing routine monitoring program of the atmosphere, by measuring suspended particulate material and particulate fall-out, should be initiated. Suspended particulate material is measured by high volume air filters, automatic filter paper strip samplers and other devices. Fall-out may be measured by conventional soot fall jars. Sulphur dioxide, nitrogen oxides, ozone and other oxidants, aldehydes, carbon monoxide, etc., should be measured to the extent necessary to indicate the magnitude of pollution by these gases. Such a program will provide information for use in planning abatement activities, determining the trend of pollution

upward or downward and in evaluating the actual or potential effects of the pollution on people, vegetation and materials.

D. Abatement Program

A considerably increased abatement activity, including technical study of sources of pollution in the City is warranted. Self initiated observations of visible emissions from sources of all kinds, including residential establishments, should be made along with the necessary activities to bring about reduction or elimination of the emissions. An additional program directed towards making widely known the proper techniques and practices in the operation and maintenance of space heating and power generation units should be carried out. The burning of refuse on residential premises in other than properly designed and operated incinerators should be prohibited.

A program of public education through the distribution of printed materials, the press, radio and television, and appearances before civic groups, should be initiated in order to secure the support and cooperation of the general public. Elimination of visible exhaust emissions from buses, trucks, and automobiles because of improper adjustment of engines, lack of maintenance, use of improper fuel and improper operation could be undertaken. As technological development proceeds, it may become advisable in the future to apply measures

to reduce or eliminate invisible emissions from automotive equipment.

E. Other Activities

1. Close liaison should be maintained with the State Air Pollution Authority.
2. Close liaison, including the maintenance of a list of operations and equipment likely to produce air pollution, should be maintained with the Bureau of Buildings, the Planning Office, and the Zoning Commission.
3. An inventory of the nature and extent of sources of pollution in the area should be prepared. This will provide information on the types of pollution sources which are of most importance for use in guiding abatement activities.
4. A study of the meteorological patterns in the area should be made to assist in the location of zones for industrial development in relation to other land uses in such a way that undesirable pollution situations will be minimized.

F. Staff and Support Required

The activities outlined above can be gotten underway through the employment of a qualified staff

of about six people. This would include a Chief, who would report to the Health Officer, and should be qualified both as a program administrator and technical leader. Both qualifications are needed, but if a choice must be made, a person with a stronger administrative competency and lesser, but adequate, technical competence would be preferable, provided he is supported by a capable technical staff. A salary of $8,000 - $9,000 per year will probably be required to obtain such a person. However, a salary of $7,500 to $8,000 would conform more closely to the existing City salary schedule. In addition, a chemical or mechanical engineer, a chemist, a sanitarian, a person familiar with combustion equipment and firing techniques and a clerk-stenographer would be required. This will entail an annual salary expenditure of about $31,000. Additional costs would be $3-6,000 for automotive equipment, $1,500 for technical field equipment, $1,500 for additional laboratory equipment, $1,500 for miscellaneous supplies and $2,000 for miscellaneous other expenses (consultants, contract services, furniture, technical books, etc.). Also, since personnel will probably be relatively new to the rapidly expanding air pollution field, it is suggested that $1,500 be provided for the purpose

of sending staff members to training courses, seminars and technical conferences.

The foregoing is based on the assumption that space and laboratory facilities presently existing in the Bureau of Health can be utilized through provision of some additional furniture, equipment and supplies. This total sum might not be required for the first year, since considerable lapses could occur in obtaining people and equipment. Expenditures can reasonably be expected to remain at this level for a few years as the program develops.

APPENDIX A

CITY OF PORTLAND, OREGON
Department of Public Safety
Fred L. Peterson, Mayor

BUREAU OF HEALTH

Thomas L. Meador, M.D., M.P.H.
City Health Officer

Horace V. Bell
Administrative Assistant

April 27, 1956

Harry G. Hanson, Director
Taft Sanitary Engineering Center
4676 Columbia Parkway
Cincinnati, Ohio

Dear Mr. Hanson:

On April 24, 1956, Mr. F. E. DeMartini and Mr. F. F. Aldridge of the Public Health Service, Regional Office, San Francisco, conferred with the members of the City of Portland Air Pollution Committee to explain what assistance could be provided by the Public Health Service under the provisions of Public Law 159. Also present at this meeting were representatives of the Mayor's office, the Oregon State Air Pollution Authority and others concerned with air pollution matters.

Many segments of the Portland community are concerned with the control of air pollution in this area. Columbia Empire Industries is sponsoring a preliminary survey of air pollution by the Stanford Research Institute. The Oregon State Air Pollution Authority has devoted a portion of its time to surveys in Portland. A continuing inquiry into various aspects of local air pollution is being made by the City's Air Pollution Control Advisory Committee. With all of these inquiries into the various aspects of local air pollution, there is a pressing need for competent technical advice to enable Portland to coordinate present activities and to develop a logical plan for air pollution control in this community.

For these reasons, an official request is being made to your department to send an engineer from the Center to meet with the City Health Officer, his Air Pollution Control Advisory Committee and other interested groups. It would be highly desirable if it could be possible for your representative to be in Portland during the week beginning May 14.

Your favorable consideration of this request will be of tremendous value to the City of Portland at this time and would be very greatly appreciated.

Sincerely yours,

/s/ Thomas L. Meador, M.D.
Health Officer